

THE RELATION OF GASTRIC ULCER TO CARCINOMA OF THE STOMACH*

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MALIGNANT DEGENERATION of a benign gastric ulcer has, for many years, been considered a frequent occurrence by many surgeons and internists who have had to treat these problems. Absolute positive evidence that a gastric ulcer may become malignant or may undergo malignant degeneration is difficult to prove histologically. Shields Warren³⁰ states that in their material at the Pathological Laboratory, where all of the Lahey Clinic's resected gastric specimens are studied histologically, there have been only four such cases in which evidence was found that cancer probably arose on the basis of pre-existent benign gastric ulcer. Meissner,¹⁹ of Warren's Laboratory, makes the statement that many gastric carcinomas are superficial, particularly in their early stages, and may undergo central peptic ulceration—thus giving a pathologic picture of both ulcer and cancer. Only when there is evidence of long-standing destruction and fibrosis of the stomach wall associated with cancer can one be suspicious of cancer arising from chronic ulcer; even here, it is difficult to prove that the long-standing disease was not a long-standing cancer. The diagnosis of carcinoma arising from benign chronic peptic ulcer, therefore, must be made with extreme caution pathologically and only when clinical and radiologic impressions are consistent with the pathologic changes.

Bockus³ is of the opinion that carcinoma of the stomach and peptic ulcer are distinct diseases, and that malignant degeneration does not occur in a gastric ulcer as often as had been anticipated, especially considering the high rate of gastric carcinoma in the population as a whole.

Mallory,¹⁶ in 1940, gave an excellent discussion of malignant degeneration of gastric ulcers and concluded that clinical statistics for the most part agree that chronic gastric ulcer rarely becomes carcinomatous and emphasized that the greatest caution is necessary in the effort to interpret from the histologic picture the origin of a malignant ulcer.

The difference in the tendency of gastric and duodenal ulcers to undergo malignant degeneration has been cited frequently as an important difference in these two ulcers. Malignant degeneration of a duodenal ulcer, for practical purposes, is rarely, if ever, seen. In the history of this clinic we have not had evidence that a single duodenal ulcer became malignant. Inasmuch as the histologic proof of such malignant degeneration in a gastric ulcer is wanting or is equivocal, much of the data supporting such conclusions have had to be based upon clinical material. Ewing⁸ stated that malignant degeneration rarely occurs in a gastric ulcer and that such origin of malignant ulcer probably accounts for not more than 2 or 3 per cent of the gastric carcinomas; however, on the basis of clinical material, the incidence of malignancy in what was thought to be a gastric ulcer, as

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proved by operation and pathologic examination, has varied from 10 to 20 per cent (Table I). Most of these were probably malignant from the beginning. This is a much more conservative and probably more accurate estimate when compared with the earlier figures of such malignancy in gastric ulcer, as in Wilson and MacCarty's³¹ report in 1909 which gave the incidence as 71 per cent. In 1924, Finsterer⁹ stated that malignant degeneration of a benign ulcer occurred so frequently that resection of a gastric ulcer may be regarded as an early operation for cancer of the stomach. Such opinions of the high incidence of malignant degeneration in gastric ulcer have undergone considerable change in the last half century, and clinical evidence seems to support the conclusion that approximately 10 to 15 per cent of ulcers that appear benign grossly on roentgenologic and clinical examination, prove to be malignant on microscopic examination. Swynnerton and True-love²⁶ in 1951, in a study of 375 cases of proved carcinoma, concluded that there was evidence that benign ulcers preceded malignancy in a high percentage of cases and cited 26 cases in this group in which there was some evidence that the neoplasm may have arisen on a simple ulcer. There was, however, no unequivocal histologic evidence for such a conclusion.

Ekström,⁶ in a review of this problem, stated that in 16 of 138 radical gastric resections, histologic study gave evidence that carcinoma had arisen from a chronic gastric ulcer. This is a very high estimate and, again, difficult to prove histologically.

Table I gives the incidence of malignancy in gastric ulcer as proved by operation and microscopic examination in a series of cases over the past 30 years. The figures vary between 10 and 20 per cent.

The substance of this paper consists of a report of 411 consecutive cases of gastric ulcers (Table II) that came to surgery because malignant disease could not be ex-

cluded clinically or because the ulcer recurred or failed to heal. Table III gives the indications for operation in a group of 346 benign ulcers and in 65 malignant ulcers proved by histologic examination. It will be evident at once that 95 per cent or more of the cases of what has been called malignant ulcer (65 in this series) are, in reality, cancerous at the onset and that this becomes a problem of discussing early diagnosis of cancer, rather than discussing the question of malignant degeneration on a benign ulcer. The subject appears in quite a different aspect when considered from this point of view.

No completely reliable clinical data are available at present to distinguish all cases of benign ulcer from malignant gastric ulcer. Such differentiation must be made by pathologic examination after removal of the tissue. With the present methods of clinical diagnosis, it is utterly impossible to make an accurate diagnosis in many of these cases, which accounts for the high incidence of gastric malignancy found at the operating table in so-called gastric ulcers. It should be pointed out, however, that these do not constitute diagnostic errors, since the majority of these patients are submitted to surgery because of the impossibility of excluding carcinoma. In this series of 411 gastric ulcers, carcinoma could not be excluded preoperatively in 195 of 411 cases operated upon (Table III and IV).

The difficulty of excluding cancer in gastric ulcers is further evidenced by the fact that a definite diagnosis of carcinomatous ulcer was made preoperatively in 44 patients of the group of 346 cases of pathologically proven benign ulcers (Table I). It may be noted also in the group of 65 cases of malignant ulcers that a diagnosis of cancer was made preoperatively in one patient (Table IV) which at operation proved to be malignant. This case must be included in this ulcer series, since a clinical diagnosis of benign ulcer was made and this patient

was treated for two and a half years prior to the diagnosis of malignant ulcer made immediately before operation.

It is our opinion, therefore, that there is not enough histologic evidence to warrant a conclusion that many carcinomas develop

treatment in the management of a chronic recurrent ulcer. A very practical consideration is that an ulcerocancer may be mistaken for a benign ulcer. This cannot be laid at the door of diagnostic error, but is due to the fact that it is impossible clin-

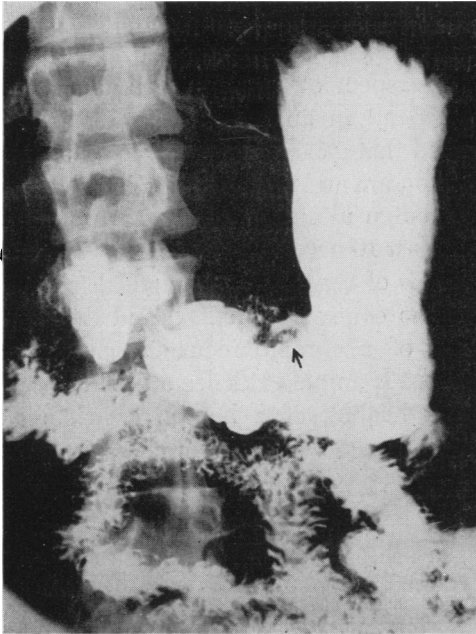


FIG. 1

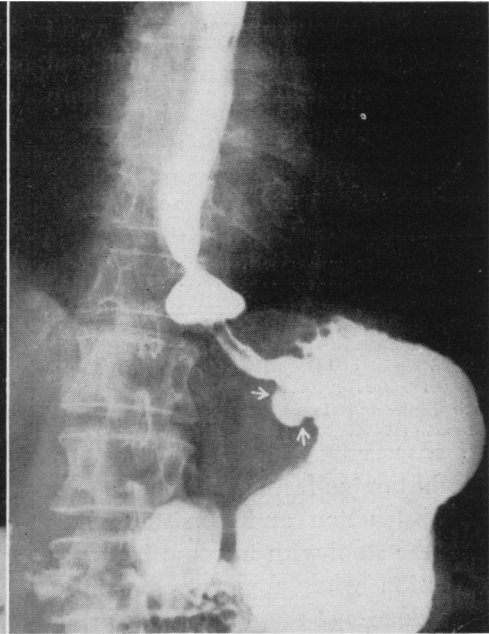


FIG. 2

FIG. 1.—Man, age 38 years, had epigastric pain for 18 months. A diagnosis was made of gastric ulcer of the lesser curvature at angle, in area of infiltration. He was treated in the hospital for two weeks, but the ulcer failed to heal. Gastric resection was performed. The pathologic diagnosis was carcinoma, 3 cm. in diameter, on the lesser curvature.

FIG. 2.—This patient, a woman, had symptoms for one year. Note ulcer high on lesser curvature, just below cardiac sphincter of the esophagus, and penetration beyond the wall of the gastric lumen. Preoperative diagnosis was gastric ulcer. Pathologic diagnosis was malignant ulcer, 2 cm. in diameter.

from a benign gastric ulcer, and it is improbable that such an origin accounts for a large proportion of gastric cancer, probably only 5 per cent. Wangenstein²⁹ has pointed out that the mortality following gastric resection for benign gastric ulcer is very small, probably less than 5 per cent. In our hands it has been 2.2 per cent, but the mortality from unrecognized gastric cancer treated medically is 100 per cent. This is a most important consideration and the physician assumes a very serious responsibility to the patient when he advises continued medical

ically to differentiate a small percentage of such ulcers, and it is this group of cases that make up a considerable percentage of operated ulcers.

Eusterman⁷ has emphasized that small ulcerating carcinomas or carcinomatous ulcers may present symptoms indistinguishable from benign ulcer, and this is the practical aspect, from the standpoint of treatment, of the problem of gastric ulcer rather than whether a benign ulcer becomes cancerous or not. He suggested clinical data that may indicate the presence of malig-

nancy and, although these clinical data are not completely reliable, the physician must be aware that cancerous ulcers may improve clinically on medical management and even show a moderate degree of healing, but never completely disappear under such treatment. Eusterman suggested that the recent onset of an ulcer, the large size of the lesion, the location (greater curvature or prepyloric area), progressive clinical

ation and at postmortem. The majority appeared so early that it was possible that the diagnosis of gastric ulcer was incorrect from the beginning. They thought that the risk of malignant degeneration in a gastric ulcer was so slight that it need hardly be taken into consideration. Here again the observers are considering solely the problem of malignant degeneration, and not the more important aspect of unrecognized ulcerocancer.

TABLE I.—Incidence of Malignancy in Gastric Ulcer Proven by Operation and Pathologic Examination.

	Per cent
Morley (1923) ²⁰	10.0
Finsterer (1939) ¹⁰	20.9
Allen and Welch (1941) ²	14.0
Marshall and Welch (1948) ¹⁸	19.8
Smith and Jordan (1948).....	16.3
Lampert, Waugh and Dockerty (1950) ¹⁵	13.0
Ekström (1952).....	11.6
Marshall (present series).....	15.8
Eusterman (1946).....	13.4

Allen,¹ in an editorial in 1951, emphasized that gastric ulcer visible on the roentgenogram and characteristic in every way of a benign ulcer may prove to be cancer in at least 10 per cent of all cases. This simple fact is of considerable practical importance in the continued medical and dietary control of a chronic recurrent gastric ulcer. There is ample evidence at hand to suggest that healing of a benign gastric ulcer is

course, histamine-fast achlorhydria, prepyloric obstruction and persistent occult blood in the stool with increase in the size of the lesion while under treatment are strong evidences of the possibility of malignant degeneration or of the presence of an ulcerocancer. Such clinical findings would certainly warrant early operation in many patients.

TABLE II.—Gastric Ulcer. 411 Operated Cases.

	Cases	Per cent
Benign ulcer.....	346	84.2
Malignant ulcer.....	65	15.8

The only safe course to follow in medical treatment of a gastric ulcer is to insist upon complete healing of an ulcer at the completion of an adequate period of controlled medical therapy. Patients with malignant gastric ulcers under medical therapy not only improve symptomatically, but often may become symptom free. A malignant ulcer may decrease markedly in size but will not completely disappear, and all of these patients with ulcers that fail to heal under good medical management must be operated on early.

often incomplete. It is exceedingly important that these patients be followed at intervals, not only for supervision of their medical therapy, but also to obtain repeated roentgenograms and even gastroscopic examination to be sure that the ulcer has remained completely healed or that it has recurred.

Malmros and Hierton,¹⁷ in an investigation of 687 medically and surgically treated cases of peptic ulcer (192 gastric ulcers), found only 12 cases of carcinoma at oper-

In our experience in this clinic, gastric ulcers have occurred in the ratio of one gastric ulcer to 12 duodenal ulcers. Approximately 37 per cent of our patients with gastric ulcers have been treated surgically.

It is of interest to note the coexistence of a duodenal ulcer and gastric ulcer. Bockus⁴ has made the statement that patients with duodenal ulcer who have marked gastric hyperchlorhydria rarely die of gastric carcinoma. Carcinoma is less likely to develop in patients with duodenal ulcer and coexistent

gastric ulcer than in those who had no stomach disease. Fischer¹¹ *et al.* in 1947, reported 48 proven cases of gastric malignancy coexistent with duodenal ulcer and concluded that such an existence was rare,

tro-enterostomy was done for gastric ulcer, in 41 for duodenal ulcer and in one for other reasons. Rivers and Stauffer²³ reported the incidence of coexistence of gastric and duodenal ulcer as 8 per cent.

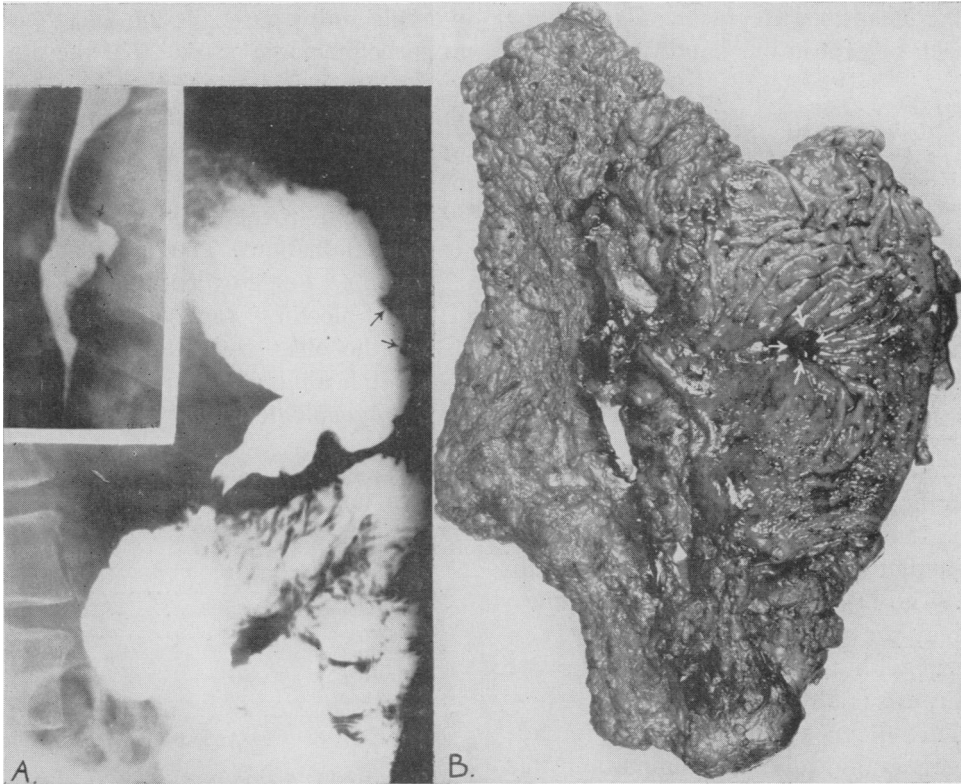


FIG. 3.—Man, age 68 years. (A) Benign ulcer on the greater curvature of the stomach; constant filling defect with demonstrable crater and diminished flexibility of gastric wall can be seen. *Insert* shows penetration of gastric wall. Preoperative diagnosis was carcinoma. (B) Specimen removed at operation; arrows indicate ulcer.

that the probability of coexistent gastric carcinoma and duodenal ulcer was one in 938 and that a patient with duodenal ulcer has relatively good assurance that the possibility of malignant development in a gastric ulcer is slight. The incidence of coexistence of duodenal ulcer and gastric ulcer in our series of 411 cases was 9 per cent. It is also of interest to note that Gray and Lofgren,²² in a review of 53 patients with lesions in the stomach after gastro-enterostomy, found that 18, or 34 per cent, had cancer. In 11 of the 53 cases, the gas-

Since surgical cure is not possible in a large percentage of cases of gastric carcinoma by the time patients seek medical advice, early and accurate distinction between benign and cancerous lesions is of paramount importance if the results of surgery for gastric ulcer are to be improved. However, Kirsner¹⁴ has pointed out that the problem of survival in gastric cancer is not entirely a matter of earlier diagnosis or radical surgery, although these factors are of considerable importance. The biologic nature of any gastric carcinoma cannot be

evaluated or the rate of growth determined, which is likewise of considerable importance in prognosis after surgical treatment.

Kirsner is of the opinion that the roentgen ray is the most important single diagnostic method for the recognition of benign and malignant gastric ulcer. Gastroscopy has been helpful in our hands, but has not

istic that the excavation does not extend into the gastric wall and the ulcer niche does not go beyond the normal limits of the gastric lumen.

Palmer²¹ pointed out that there are many pathognomonic signs of malignant disease in an ulcerating gastric lesion, but there are no pathognomonic criteria that the ulcer is benign. It is important, therefore, to emphasize that if the physician recommends medical management, the course of treatment of the gastric ulcer must be followed by repeated roentgenologic and gastroscopic examinations. The only reliable data of a healing benign ulcer are the absence of occult bleeding, progressive decrease in size of the ulcer with disappearance, and complete healing of the crater as evidenced by roentgenologic and gastroscopic exam-

TABLE III.—*Indications for Operation in 346 Cases of Benign Gastric Ulcer.*

Indications for Operation	Cases
Carcinoma.....	44
Unable to exclude carcinoma.....	113
Recurrence of gastric ulcer.....	110
Failure to heal.....	49
Pyloric obstruction.....	18
Hemorrhage.....	9
Incidental finding at laparotomy.....	2
Perforation.....	1

often made possible the accurate differentiation between a benign and malignant lesion. It has aided, however, in determining whether healing after treatment is complete. The histologic method of Papanicolaou may prove to be more promising, particularly with the newer balloon abrasive technic, as suggested by his group.

When a diagnosis of gastric ulcer is made roentgenographically, it is important that the clinician and the roentgenologist weigh their clinical and roentgen information and make a decision as early as possible regarding the type of treatment to be employed. Both should follow the case closely and frequently until it is proved that the ulcer has healed and disappeared, or has failed to heal (Fig. 1) or has recurred, with surgical intervention being utilized promptly, since there is still a 10 to 20 per cent chance that the ulcer is malignant. Kirklin¹³ has stated that the important roentgenologic characteristic of benign ulcer is the projection of the ulcer niche beyond the normal wall of the stomach, as the crater of a true ulcer. This can also occur in malignant ulcer (Fig. 2). On the other hand, small, ulcerating carcinomas have the character-

TABLE IV.—*Indications for Operation in 65 Cases of Malignant Gastric Ulcer.*

Indications for Operation	Cases
Carcinoma.....	1*
Unable to exclude carcinoma.....	37
Recurrence of gastric ulcer.....	17
Failure to heal.....	5
Obstruction.....	5
Hemorrhage.....	0

*Roentgenogram evidence and treated for gastric ulcer for 2½ years.

inations. The physician must be certain that such patients are examined every two months for a minimum of six months. If the ulcer recurs, surgical resection is an absolute necessity in view of the evidence that 10 to 20 per cent of all cases of gastric ulcer are malignant.

There are no signs or symptoms that can be said to be typical of benign or malignant ulcer; the size of the ulcer, its site of origin, the age of the patient and the level of gastric acids give little reliable information regarding the presence or absence of malignant disease in these gastric ulcers.

In this study of 411 patients with gastric ulcer, it is of interest to note the similarity in the sex incidence. In the group of 346 patients with benign ulcer, the ratio was 2.7

males to 1 female (Table V). The same ratio held as far as malignant ulcer is concerned, 2.8 to 1. This closely approximates the sex ratio noted in gastric carcinoma, which in our study of 1600 cases of carcinoma was 2 to 1.

youngest patient with a malignant ulcer was 20 and the oldest was 79 years. The youngest patient with a benign ulcer was 26 and the oldest was 82 years of age (Table VII).

The location of the ulcer is of some importance in distinguishing between benign

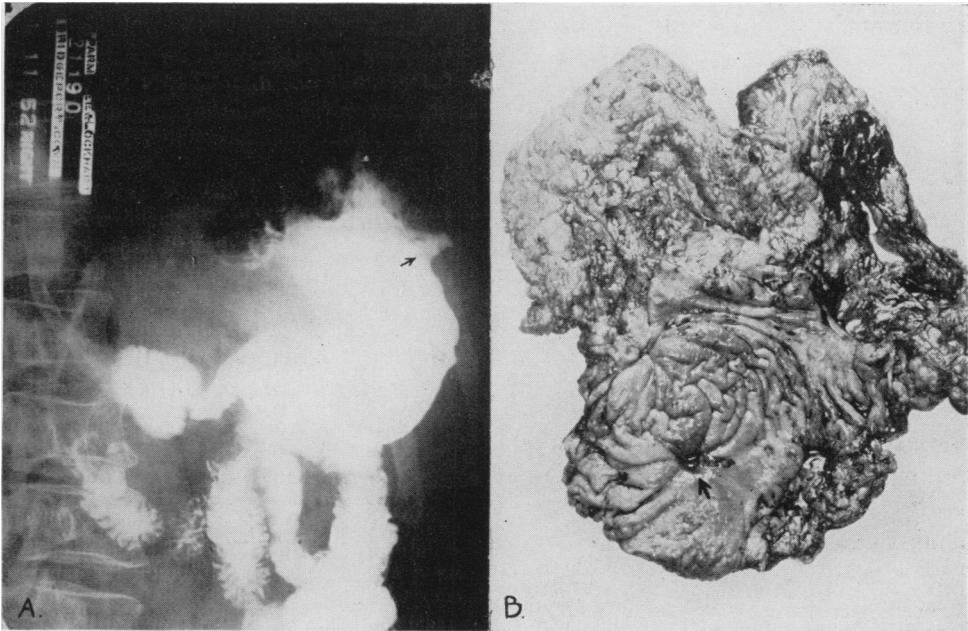


FIG. 4.—Man, age 69 years, had symptoms for two and a half months. (A) Penetrating ulcer high on the greater curvature of the stomach can be seen. Gastric resection was performed. Pathologic diagnosis was active peptic ulcer on the greater curvature. (B) Resected specimen; note ulceration on the greater curvature.

It is well known that gastric ulcer occurs more frequently in men than in women, and this is true of gastric carcinoma. Dible⁵ stated that 72 per cent of gastric ulcers occur in the male, while Walters and Claggett²⁸ found that of 272 patients operated on for gastric ulcer, 80.9 per cent were men. In our series there were 297 males (72 per cent) and 114 females.

The average age of patients with gastric ulcer is similar to that of patients with gastric carcinoma. Age incidence in this group is given in Table VI. The average age of patients with benign gastric ulcer was 53 years and with malignant ulcer, 53.5 years. The average age of patients in the series of 1600 gastric carcinomas was 57 years. The

and malignant ulcers of the stomach, but it must be emphasized that either type will occur in any part of the stomach. As noted previously, Eusterman thought that location of an ulcer on the greater curvature or prepyloric area indicated a high probability of the presence of a malignant ulcer (Figs. 3, 4 and 5). Swynnerton and Truelove are of the opinion that ulcers of the prepyloric region are extremely likely to become malignant. Although ulcers located in these regions should be looked at with considerable suspicion, such a location is by no means evidence of their benignity or malignancy (Fig. 6). Stewart,²⁵ in 1929, in a study of 4000 consecutive necropsies at Leeds General Infirmary, found chronic

gastric ulcer in 9.55 per cent; 51.5 per cent were within 5 cm. of the pyloric ring and there were 14 benign ulcers on the greater curvature. Portis and Jaffe,²² in a study of peptic ulcer based on necropsy records, found 59 per cent of the ulcers within 5

the greater curvature are not as common as we are led to believe. We agree that a patient with a prepyloric ulcer should be observed very closely under treatment, and in the majority of cases should have surgical treatment, yet in our series the incidence of

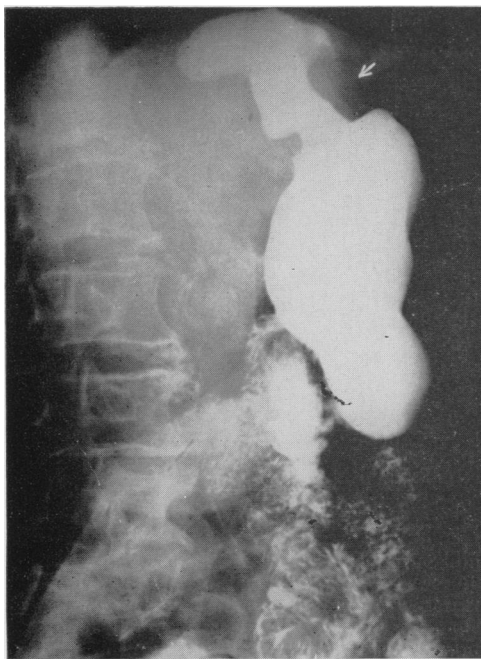


FIG. 5

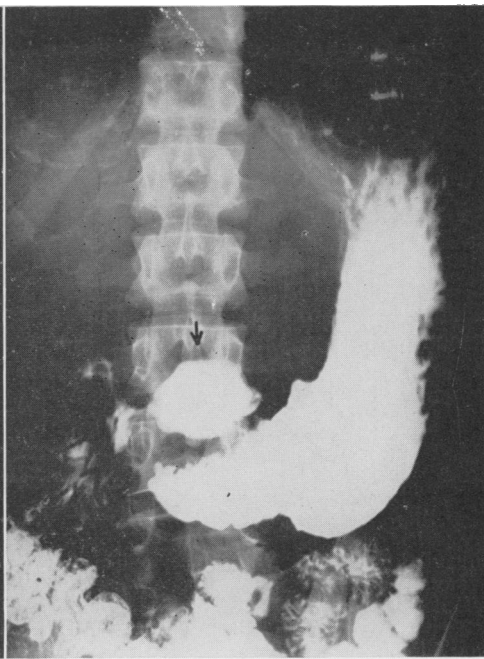


FIG. 6

FIG. 5.—Man, age 57 years. Large filling defect can be seen, replacing most of the fundus and involving both curvatures. Preoperative diagnosis was carcinoma. Total gastrectomy was performed; specimen contained a widespread lesion of the upper part of the stomach. Pathologic diagnosis was active peptic ulcer of the greater curvature.

FIG. 6.—Man, age 44 years, had symptoms for two months, with weight loss of 17 pounds. Large ulcer, with meniscus formation, can be seen in the prepyloric area on the lesser curvature. Ulcer measured 4 cm. in diameter. Pathologic diagnosis was benign ulcer.

cm. of the pyloric ring. Figures 7 and 8 give the location of the gastric ulcers, both malignant and benign, in this series; in the group of 346 cases of benign ulcers, 32 per cent were within the prepyloric area and 10 were on the greater curvature.

Although this series of malignant gastric ulcers is small, we believe it is of some significance that nearly half (44.5 per cent) of the malignant ulcers were in the prepyloric area. There were only two cases in which the malignant ulcers were on the greater curvature. On the other hand, ulcers on

malignant ulcer in this region was not much greater than the incidence of benign ulcer, 44.5 to 32 per cent. It must be remembered, however, that gastric carcinoma arises in this region more commonly than in any other part of the stomach, and serious consideration should be given to this fact. It is significant that the majority of benign ulcers occur on the lesser curvature of the stomach; this origin very properly suggests a benign ulcer and warrants medical therapy unless roentgenologic or gastroscopic evidence is to the contrary. In this group of

346 cases of benign ulcers, 64 per cent were located on the lesser curvature, and yet 43 per cent of the malignant ulcers also were in this region. It is also significant and important to point out that while the criterion suggested by Kirklin of projection of the ulcer crater beyond the normal boundary

with malignant ulcers, only 31 per cent had symptoms for one year or less, whereas 69 per cent had symptoms for more than one year and 49 per cent had ulcer-like distress for five years or longer. It cannot be concluded that in this group of patients with symptoms for five years or longer, carcinoma developed in a long-standing ulcer, because we lack proof that an ulcer was present, and their digestive symptoms may well have been due to other causes. Likewise, 45 per cent of patients with benign gastric ulcers had symptoms for one year or less and of the remaining patients who had symptoms for more than one year, 30 per cent had digestive symptoms for five years or longer.

Clinical differential diagnosis is of considerable importance, but the only reliable criteria of the true nature of a gastric lesion is a pathologic examination of the removed ulcer, which presents the only definite evidence of a benign or malignant lesion. However, to submit every patient with a

TABLE V.—Sex Incidence in 411 Operated Cases of Gastric Ulcer.

	Male	Female	Total
Benign ulcer.....	249	97	346
Malignant ulcer.....	48	17	65
Total.....	297	114	411
Ratio:	Male to female		
Benign ulcer:.....	2.7 to 1		
Malignant ulcer:.....	2.8 to 1		

of the gastric walls indicates a benign ulcer, this occurred in an appreciable number of our malignant ulcers. The meniscus sign of Carman frequently has indicated a malignant ulcer.

The size of the ulcer is of some importance. Benign ulcers can be quite large; frequently a benign lesion is greater than 2.5 cm. in diameter. In Table VIII a summary is given of the size of benign and malignant ulcers as found on pathologic examination. It has been thought an ulcer larger than 2.5 cm. in diameter strongly indicates malignancy. In our group of malignant ulcers 49.2 per cent were larger than 2.5 cm., whereas in the benign group (Table VIII; Fig. 9), 22 per cent were larger than 2.5 cm. The smallest malignant ulcer noted at operation was 7.5 mm. in diameter, and the smallest benign ulcer was 8 mm. in diameter. Although the size of the ulcer and its location are of some help in determining the presence or absence of malignant disease, these factors are by no means dependable criteria of the presence of carcinoma or of a malignant ulcer.

A study of duration of symptoms has been of no value in differentiating malignant and benign ulcers. In the group of 65 patients

TABLE VI.—Age Incidence in 411 Operated Cases of Gastric Ulcer.

Age by Decades, Years	Benign Ulcer, Cases	Malignant Ulcer, Cases
20-29	2	2
30-39	43	6
40-49	81	13
50-59	135	26
60-69	71	17
70-79	13	1
80	1	0
Total.....	346	65

gastric ulcer to surgery would result in many patients with benign lesions having unnecessary operative procedures. In our experience in the clinic, 37 per cent of our patients with gastric ulcers have had surgical treatment; we believe, however, that a larger group should have surgical treatment. By far the larger group has been treated conservatively and, in most instances, successfully by dietary and medical methods. The therapeutic test of adequate

medical treatment in the hospital is of considerable value and helps immeasurably in making a decision for or against surgery—whether surgery is necessary or medical treatment should be continued—but this decision should be made much earlier than it has been and preferably while the patient is still in the hospital. It should not be deferred until the patient has been treated repeatedly for recurrent symptoms.

patient should be operated on immediately in the vast majority of cases, that is, unless his general physical condition makes operation hazardous. The danger of overlooking gastric carcinoma and the risk of surgical intervention must be weighed most carefully. Should the ulcer fail to heal while the patient is in the hospital, that patient should have surgical treatment, usually gastric resection.

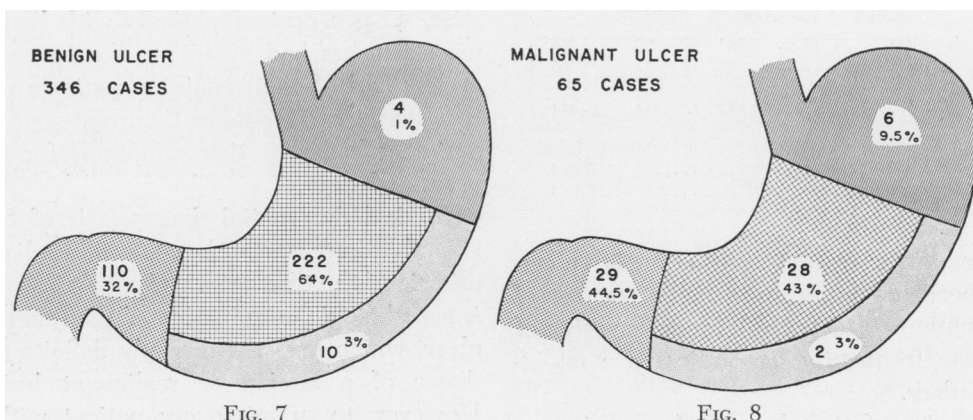


FIG. 7.—Benign gastric ulcer, 346 cases. Location and percentages of benign ulcers in this series are indicated. Note 10 cases of benign ulcer on the greater curvature.

FIG. 8.—Malignant gastric ulcer, 65 cases. Site of origin of the group of malignant ulcers is shown. Note percentages in these areas as compared with benign ulcers.

All patients with gastric ulcer who undergo medical observation and therapy should be in the hospital and we must insist on complete healing of the ulcer crater at the end of a period of well-controlled medical therapy (Fig. 1). These patients with medically treated gastric ulcers not only must improve symptomatically, but they must become completely symptom-free. The ulcer should decrease progressively in size; there should be absence of occult blood in the stools and progress examinations with the roentgen ray and gastroscopy should show that the ulcer is completely epithelialized. Careful follow-up observations should reveal that healing is maintained and that the ulcer does not recur. Should such an ulcer recur at any time in the future, as evidenced by repeated examinations, that

We believe that if there is any question whatever concerning the presence of gastric malignancy, that patient also should be operated on while in the hospital. Walters²⁷ has made the statement that all patients more than 40 years of age who have chronic, recurring gastric ulcers should have surgical treatment because of the danger of malignancy, because of the low operative risk rate and the excellent results following operation. We are in complete agreement with such a method of treatment. Our experience with this series of 411 cases of gastric ulcer has emphasized the need for surgical treatment in almost half of the cases studied.

Should the ulcer fail to heal, should it recur or should we be unable to exclude malignant disease, operation must be em-

ployed as soon as possible, and in the majority of cases this should be gastric resection provided the patient's condition permits a radical procedure. A gastric ulcer high on the lesser curvature has always presented a somewhat difficult problem to the surgeon because of its height and location, and if the ulcer is large and extensive, a total gastrectomy may be required. However, ulcers near the esophagogastric junction can

ulcers, a mortality of 2.3 per cent, and one death in the group of 65 patients with malignant ulcers. The resection of a gastric ulcer is a much easier procedure than resection of a duodenal ulcer. The technical details of resection of a gastric ulcer are much less involved than of a duodenal ulcer, and the mortality conceivably can be extremely low. The technical difficulties of duodenal transection and closure for gastric ulcer are much less than for duodenal ulcer. The mortality in duodenal ulcer is largely related to the degree of involvement by the ulcer of the head of the pancreas and of the common bile duct. The induration often makes anatomical dissection hazardous and the closure of the duodenum at times may be very difficult. The mortality following resection of gastric ulcer as given in the literature varies from 2 to 5 per cent.

We do not believe that vagotomy should be employed in the treatment of gastric ulcer, with the rare exception of a case in

TABLE VII.—Age of Patients.

	Years
Average age:	
Benign ulcer.....	53.0
Malignant ulcer.....	53.5
Youngest with carcinoma.....	20
Youngest with benign ulcer.....	26
Oldest with carcinoma.....	79
Oldest with benign ulcer.....	82

be resected in a large percentage of cases without performing total gastrectomy. When the gastrohepatic omentum is detached, frequently there is sufficient room above the ulcer to permit resection of the stomach and removal of the ulcer without encroachment upon the esophagogastric junction. Whether the ulcer is too high to permit partial gastrectomy cannot be determined solely from the roentgenogram. This can be determined only at the operating table when the stomach is completely mobilized and the relationship of the ulcer to the esophagus is clearly delineated.

In 13 patients, however, total gastrectomy was done for benign ulcerating lesions of the stomach (Fig. 5). The only death occurred in a patient with a huge perforated ulcer which was thought to be carcinoma and upon whom a total gastrectomy was done as an emergency measure. Adequate follow-up data are now available in all 12 of the patients who had total gastrectomy and excellent results were obtained in all of these cases.

The mortality in this series of 411 cases was 2.2 per cent. There were eight deaths in the group of 346 patients with benign

TABLE VIII.—Size of Gastric Ulcer.

	Malignant	Benign
Larger than 2.5 cm.....	49.2%	22%
Largest.....	6 cm.	8 cm.
Smallest.....	0.75 cm.	0.80 cm.

which resection is contraindicated because of the patient's condition or because the ulcer is high in the lesser curvature. Even in these cases the ulcer should be excised locally in order to obtain reliable histologic evidence of the absence of a carcinoma in the ulcer. However, it is our opinion that a partial gastric resection carries as small a risk as that associated with vagotomy and local excision of the ulcer, and is a preferable surgical procedure. Patients with gastric ulcer who are treated in the hospital by dietary and medical methods should remain in the hospital at least three weeks. In Smith and Jordan's²⁴ report of a group of 600 patients treated medically and surgically, 145 patients were under treatment and observed frequently by roentgeno-

grams; healing was noted to be complete in 84 cases within four weeks and in 52 cases within five to eight weeks. Smith and Jordan suggested that healing should be complete within six to eight weeks in all pa-

in this report in which operation was performed later than 1951.

SUMMARY

A group of 411 consecutive cases of gastric ulcer in which surgical resection was performed is reported. The incidence of malignant ulcer in this group was 15.8 per cent.

It is our opinion that there is insufficient histologic evidence to warrant a conclusion that gastric ulcers present a high potential origin for malignancy. Unquestionably, secondary malignant degeneration does occur on a chronic gastric ulcer, but probably in not more than 5 to 6 per cent. A more practical assumption in this problem is that an ulcerocancer may be mistaken for a benign ulcer, and continuation of medical therapy may result in dangerous delay of treatment of gastric malignancy.

Clinical data will enable the physician to recognize the probability of malignancy or benignity in a large percentage of cases but will not exclude cancer in a considerable number of these patients.

Adequate medical treatment in the hospital is a valuable therapeutic test and should be used in a large number of these patients, particularly in patients who have not had adequate medical treatment and who have none of the diagnostic signs of an ulcerocancer.

If healing of the ulcer is not progressive or complete, surgical treatment is mandatory.

Clinical criteria, such as size of ulcer, location of lesion, age of the patient and history, are not completely reliable and if malignancy cannot be excluded by all methods of examination, including a therapeutic trial, surgical intervention is an absolute necessity.

The routine surgical treatment of all cases of uncomplicated gastric ulcers is not recommended and is undesirable; in a considerable percentage of cases it cannot be



FIG. 9.—Man, age 54 years, had symptoms for two weeks. Note large ulcer of the lesser curvature and diminished flexibility of the gastric wall. Pre-operative diagnosis was gastric carcinoma. At gastric resection a tumor, measuring 6 cm. in diameter, was removed; it contained an ulcer 2.5 cm. in diameter and 1.5 cm. in depth, with edges overhanging. Pathologic diagnosis was active peptic ulcer with acute gastritis.

tients. Unless one can be assured that the ulcer healing is a progressive process and results in complete healing, surgical resection is an absolute necessity.

Postoperative results, in general, are excellent; mortality can be kept at a minimum, clinical results are extremely satisfactory and recurrent ulcer after resection is infrequent; to our knowledge, a recurrent ulcer has not developed in any of these cases, although the follow-up period in some cases is too brief to evaluate. No cases are included

regarded as a prophylactic measure against the development of carcinoma of the stomach. We do not advocate or advise immediate operation in every case of gastric ulcer, but it is our opinion that a higher percentage, probably 50 per cent or more, of chronic gastric ulcers should be resected, since an appreciable number (15.8 per cent) have been found at operation to be malignant. Temporizing with a nonhealing, ulcerating lesion of the stomach involves serious risk to the patient and is completely unjustified.

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